THURSDAY, JANUARY 1, 1914.

EVOLUTION AND GENETICS.

Problems of Genetics. By William Bateson, F.R.S. Pp. ix+258. (London: Oxford University Press; New Haven: Yale University Press, 1913.) Price 17*s.* net.

IN 1901 there came into the possession of Yale University the sum of 85,000 dollars with which to establish an annual course of lectures "designed to illustrate the presence and providence, the wisdom and goodness of God, as manifested in the natural and moral world." The endowment is not incomparable in scope and purpose with the well-known Gifford Trust at the Scottish Universities, but it is perhaps characteristic of a younger nation to prefer the natural world to the moral, and rather to seek for wisdom in the facts of nature themselves than in the philosophic wrappings spun around them by the learned through the ages. Certainly it would appear logical that any appraisement of the Almighty's influence in the natural world should be preceded by some knowledge of nature itself.

The task which Mr. Bateson, as Silliman lecturer, set before himself was a discussion of some of the wider problems of biology in the light of knowledge acquired by Mendelian methods of analysis, and the reader who would get most from the book should have some acquaintance with the phenomena of heredity recently brought to light by the method of experiment. To one with even an elementary knowledge of these phenomena, Mr. Bateson's book cannot fail to prove of absorbing interest. For he has the rare gift of infusing something of strangeness into the commonplace, and in his hands the seemingly familiar takes on an aspect of remoteness which once again provokes curiosity.

Nearly twenty years ago the author laid stress on the distinction between meristic and substantive variation, and to-day he is able to emphasise that distinction. The one is connected with the mechanical side of genetics, with the manner in which material is divided and distributed; while the other deals with the chemical side, with the constitution of the materials themselves. To the mechanical problems of genetics, the problems involved in cell division and in the repetition of parts, two of the earlier chapters in the book are devoted. As the result of an interesting discussion Mr. Bateson formulates the rule that germ cells differ from somatic cells in that their differentiations are outside the geometrical order which governs the differentiation of the somatic cells. With the germ cell begins a new geometrical order—a new individual. As to the process which led to the new order—why the cell divides, and why parts become repeated—we are as much in the dark as ever. Mr. Bateson suggests interesting analogies, such as a series of wind-made ripple marks on sand. Yet what is the wind, the meristic force that acts on cell and tissue? The answer is at present beyond us, but Mr. Bateson is not without hope that when the more highly analytical mind of the trained physicist is brought to bear upon the problem, a solution will ultimately be found. At any rate he is not disposed to follow Driesch in declaring that the expression of the living machine in terms of natural knowledge is a hopeless undertaking.

The greater part of the book is concerned with substantive variation, and it is pointed out that through recent work, genetical and chemical, a start has been made towards a real classification of these phenomena. The structural and colour varieties of the sweet pea, the primula, or the mouse can be related to the wild form in terms of their factorial composition. On an evolutionary interpretation it must be supposed that the new form has arisen by the loss of a factor, or, much more rarely, by the addition of one. Can we suppose that species are related to one another in a similar way? Owing to sterility, experimental evidence is generally difficult to obtain, but there are strong indications that some interspecific crosses will eventually find a simple interpretation in terms of Mendelian factors. To what extent such an interpretation may be widely applied, Mr. Bateson is uncertain, but so far he does not see any fatal objection. Even in the well-known case of the Œnotheras, which comes in for lengthy discussion, an explanation in terms of factors is not yet precluded.

Three chapters are devoted to variation and locality, and several interesting cases are brought forward which will probably be unfamiliar to many readers of the book. The main drift of these chapters is the difficulty of accounting for such cases through the agency of natural selection. "Had the phenomena of local variation been studied in detail before Darwin wrote, the attempt to make selection responsible for fixity wherever found could never have been made."

Perhaps the part of the book which will be read with most interest by zoologists is that devoted to the effects of changed conditions. Considerable stir in the biological world has been created recently by experiments which appear to demonstrate the transmission of an effect produced in an organism by a specific alteration of the conditions under which it normally lives. The best known instances are probably Tower's experi-

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ments with the potato-beetle and Kammerer's with various amphibia Mr. Bateson has rendered valuable service by subjecting the accounts of these and other experiments to critical examination, and he argues strongly against accepting any case of the kind yet brought forward on the evidence at present available.

Taken altogether, this is the freshest and most original book on the problem of species that has appeared for many a year. Whether the reader sees eye to eye with Mr. Bateson or not, there can be no question about its stimulative value. Even if we are further off from the goal than most biologists suppose, there is the consolation that the road to it is more than ever a road of adventure.

TYPICAL GEOGRAPHY BOOKS.

(1) *A Text-book of Geography.* By A. W. Andrews. Pp. xii + 655. (London: Edward Arnold, 1913.) Price 5*s.*

(2) *The Upper Thames Country and the Severn-Avon Plain.* By N. E. MacMunn. Pp. 124. (Oxford: Clarendon Press, 1913.) Price 1*s.* 8*d.*

(3) *A Leisurely Tour in England.* By J. J. Hissey. Pp. xviii + 400 + plates. (London: Macmillan and Co., Ltd., 1913.) Price 10*s.* net.

(1) MR. ANDREWS'S text-book is particularly important from three points of view. He has paid special attention to climate, to maps, and to typical physical conditions. In reference to climate he makes great use of theoretical sun-force, based upon the mid-day altitude of the sun, of actual isotherms, and of the periods in months when temperatures lie between certain limits, *e.g.* 50°—68° F. From the data which he supplies, the student who works through the exercises provided will have a definite and precise knowledge of the climatic facts of the world, arranged in a systematic way. The presentation is novel, but none the less valuable. The numerous maps are appropriate and useful, and the author emphasises the point that most maps used by students are better called diagrams than maps. It is unfortunate that the methods of shading employed for some of these maps makes it difficult to follow the details closely; and even broad points of resemblance and contrast do not show with sufficient clearness; the maps which appear towards the end of the book are a distinct improvement in this respect.

Countries are described in turn; for example, Russia in Europe is considered in five pages of text; climate, products, and trade are briefly summarised, and the main description is given under the heads of the separate river basins and their drainage regions. This illustration will suffice to show the main emphasis of the book, and to indicate that the outlook is physical, not human, physiographic, not economic. This is distinctly a book for the teacher's book shelves.

(2) Miss MacMunn's brief study is an excellent example of work on a definite region. Simply written, it provides sufficient evidence of a geographical kind to interest readers of all ages, and the general treatment is so suggestive that older students should be able to obtain an accurate knowledge of the district studied, not only from the text, but from the numerous maps, which are clear and precise in their presentation of the facts which they are intended to indicate. It seems rather a pity that opportunity was not taken to indicate on some of the maps the location and range of view of the camera for some of the more important photographic illustrations. The fact that many readers will find it necessary to consult Ordnance Survey maps of the district is not in itself a blemish, for the older student who can use such maps will find that Miss MacMunn's book suggests ideas which may be profitably followed out in connection with the multifarious detail which these maps contain.

(3) Mr. Hissey's book is a delightful record of a leisurely tour in search of the picturesque. He reaped the reward of loitering by the way, and found the unfamiliar in a familiar land in a pilgrimage by means of a trustworthy little motor-car through parts of rural England, than which he can imagine no more delightful touring ground. So the author speaks of his book in the preface, and his work breathes the calm and peaceful delight which he took in the pastoral scenery, the quiet homesteads, the peaceful villages. The charm of the book is increased by the numerous appropriate illustrations. B. C. W.

ORGANIC CHEMISTRY, AND ONE OF ITS APPLICATIONS.

(1) *Organic Chemistry for Advanced Students.* By Prof. J. B. Cohen, F.R.S. Vol. ii. Pp. vii + 427. (London: Edward Arnold, 1913.) Price 16*s.* net.

(2) *The Volatile Oils.* By E. Gildemeister and Fr. Hoffmann. Second edition by E. Gildemeister. Authorised translation by Edward Kremers. Vol i. Pp. xiii + 677. (London, Bombay, and Calcutta: Longmans, Green and Co., 1913.) Price 20*s.* net.

(1) IN the present writer's student days the favourite text-book of advanced organic chemistry was Prof. von Richter's well-known work, which had just been translated into English. Roughly, one might express the difference between that work and Prof.

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